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TRANSACTIONS

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32 VICTORIA STREET
LONDON SW1

NOTES ON RECENT MEETINGS AND EVENTS

General Meeting in London.

A joint meeting with the Association of Supervising Electrical Engineers was held in the Lecture Theatre of the E.L.M.A. Lighting Service Bureau (2, Savoy-hill, London, W.C.2), on Tuesday, November 16. The chair was taken by Mr. J. R. Beard (president of the Association of Supervising Electrical Engineers), who was supported by the President of the Illuminating Engineering Society (Dr. S. English).

A Paper entitled "Lighting for Special Industrial Purposes," illustrated by numerous demonstrations and lantern slides, was presented by Mr. S. Anderson and Mr. W. R. Stevens, and an interesting discussion ensued, in which the following took part: Dr. S. English, Mr. E. W. Murray, Mr. G. Jelley, Mr. T. Kenny, Mr. O. E. Mainder, Mr. J. S. Dow, Mr. F. C. Aldred, Mr. R. O. Ackerley, Mr. J. Oates, Mr. P. S. Barton, Mr. J. J. Smith, Mr. E. H. Brodie, Mr. A. S. H. Brackenbury, and Mr. F. C. Smith.

In the course of the proceedings votes of thanks were accorded to the authors for their paper, and to Mr. Beard for presiding.

In conclusion, the hon. secretary briefly announced forthcoming events and drew attention to the list of applicants for membership, which was presented on the notice board for the information of members present.

Sectional Meetings.

Decorative Lighting Section.

The opening meeting of the Decorative Lighting Section took place in the Lecture Theatre of the Institution of Mechanical Engineers, London, on November 9, when Mr. A. W. Beuttell presided.

An address on the lighting of the International Exhibition in Paris was delivered by M. Dourgnon, who had come over from Paris specially for the purpose. The address was illustrated by numerous lantern slides and by a film in colour illustrating effects of illuminated fountains, fireworks, and other special devices. A special feature of the display emphasised by M. Dourgnon was the co-ordination of light and music. Mr. R. O. Sutherland, who followed, gave an account of his impressions of the lighting of the Exhibition, also illustrated by lantern slides of photographs and sketches. In the ensuing discussion Mr. A. Cunnington and Mr. J. S. Dow referred to the experiences of the party of members who visited Paris in September last, and Mr. F. P. Bentham and Mr. W. G. Raffe also discussed the effects shown. A cordial vote of thanks to M. Dourgnon and Mr. R. O. Sutherland terminated the proceedings.

Photometry Section.

A meeting of the Photometry Section was held in the Holophane Lecture Theatre (Elverton-street, Westminster), on November 23, when a Paper dealing with the Photometry of Projectors was read by Dr. W. M. Hampton. A number of interesting technical points were raised, in particular the effect of atmospheric absorption, which had proved to be a very variable factor. The discussion was opened by Dr. J. W. T. Walsh. Amongst others who took part were Mr. E. Chivers, Mr. J. M. Waldram, Mr. S. Harcombe, Mr. H. J. A. Turner, Col. C. H. Silvester Evans, Mr. J. S. Dow, Mr. C. A. Morton, and Mr. F. C. Smith. After Dr. Hampton had replied to the discussion he was accorded a very cordial vote of thanks for his Paper, on the motion of the Chairman, Mr. H. Buckley, who endorsed the hope expressed by several speakers that arrangements would be made for the paper to be reproduced in full in the TRANSACTIONS.

A vote of thanks to Messrs. Holophane, Ltd., for their hospitality terminated the proceedings.

FORTHCOMING EVENTS

1938.

LONDON.

Jan. 11th. Mr. R. O. ACKERLEY on **Decorative Materials and their Response to Light** (General Meeting of the Illuminating Engineering Society), *(E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2)*; **6.30 p.m.**

Jan. 18th. Visit (Photometry Section of the Illuminating Engineering Society) to the Paint and Varnish Research Laboratory, Teddington, to be followed by an address dealing with the **Application of Photometry to Paint Research; 6.30 p.m.**

Jan. 28th. Mr. M. G. BENNETT on **Railway Lighting** (Joint Meeting with the Public Lighting Section and the Industrial Lighting Section of the Illuminating Engineering Society), *(E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2)*; **6.30 p.m.**

MANCHESTER.

Jan. 24th. Mr. J. EDGAR on **Lighting for Sport Entertainment** (North-Western Area Local Centre of the Illuminating Engineering Society), *(Engineers' Club, Albert Square, Manchester)*; **7.15 p.m.**

LEEDS.

Jan. 17th. Visit (North-Midland Area Local Centre of the Illuminating Engineering Society) to Montague Burton, Ltd., Hudson Road Mills, Leeds; **4 p.m.**

Jan. 17th. Mr. J. W. HOWELL on **Lighting in the Textile Industry** (North-Midland Area Local Centre of the Illuminating Engineering Society), *(Electricity Showrooms, The Headrow, Leeds)*; **7 p.m.**

GLASGOW.

Jan. 19th. Open discussion on **Industrial Lighting and the Accident Hazard** (Scottish Local Centre of the Illuminating Engineering Society), *("The Gordon," 19, Gordon Street, Glasgow, C.1)*; **7.30 p.m.**

DUBLIN.

Jan. 6th. Professor G. B. VAN DER WERFHORST on **The Sodium Electric Discharge Lamp** (I.F.S. Local Centre of the Illuminating Engineering Society), *(Engineers' Hall, 35, Dawson Street, Dublin)*; **8 p.m.**

Recent Publications.

The Society's "Recommended Values of Illumination," and its Recommendations in regard to the Use of Portable Photometers, which appeared in the TRANSACTIONS for August, 1937, and May, 1937, respectively, have now been reprinted in leaflet form. Single copies (price 6d. each) may be obtained from the hon. secretary. Special terms will be quoted for larger quantities.

INAUGURAL ADDRESS TO THE PUBLIC LIGHTING SECTION

By C. C. PATERSON, O.B.E., D.Sc., M.Inst.C.E., M.I.E.E. (Past-President).

(Address delivered on Friday, October 29th, 1937.)

Scope and Purpose.

This section has, I believe, a greater future before it, and a greater contribution to make to illuminating engineering as a whole, than has any other. Our problem in illuminating engineering is not so much the *doing* of what we want to do, as of *knowing* what we want to do. We can design lighting units to give required light distributions much more precisely than we can specify what the light distribution ought to be, because we do not really know how we use our eyes or what our optima are. Now in street lighting, complex as it is, the problems are definite and the requirements strict. We can here, more easily perhaps than in other fields of work, get a clear view of the matter and do something definite. The attention of many skilled investigators all over the world is concentrated here, and if we solve this problem, as it seems likely that we shall, we shall have done service not only to street lighting and to the safety of everyone at night, but to all branches of illuminating engineering and even to other and older branches of science beyond our own.

This section, I take it, treads the same path with the A.P.L.E. so far only as the technical and scientific aspects of the subject of street lighting are concerned.

But I assume that this section of the I.E.S. covers a somewhat wider field:

Automobile lighting.
Sports and garden lighting.
Street lighting.
Traffic lighting.
Possibly, Aviation lighting.

In these days when whole blocks of subjects are liable to be taken over by "authorities" we must take care that we do not assume that the scientific and technical study of such subjects is no longer the business of anyone but the technical staffs of the "authorities."

When these authorities are enlightened it is the last thing they themselves desire.

Thus the Post Office is the most powerful single influence in the field of communications, but it uses its influence to stimulate those outside the official sphere to interest themselves in the study of the technical and scientific side of their art.

And now that the Ministry of Transport has taken direct responsibility for the administration of trunk roads, I know the last thing it desires is that others who are interested and are expert in the technical aspects of the problem should "keep off the ground." Far from it. The Ministry would only be forced into the attitude of exclusiveness if those outside it refrain from feeling a proper responsibility as scientific men in their problems.

Where services are military the situation is, of course, special—but the military case is not a precedent. Aviation is as much civil as military.

I hope I may be forgiven if I labour this point a little more—for its consequences are more far-reaching than they appear at first sight.

A manufacturing industry which is trained by a public authority or Government department to do just what it is told—which has little say in, or opportunity to study, the technical policy, nor to take responsibility for the satisfactory overall operation of a service, public or otherwise—will never build up a technical strength or independence which will enable it to secure the confidence of overseas authorities, and so be entrusted with their contracts.

The overseas or foreign buyer goes to the manufacturing concern, whether it be for telephones, or aviation equipment, or street lighting, which can show that it has a complete mastery of knowledge and experience in the service it purports to give.

Part of that knowledge and experience is built up by the free discussion and criticism of all technical phases of the subject at such societies as this.

I trust I may not be considered presumptuous if I call attention, once again, as others have done before, to the fact that officials of authorities and State establishments who find themselves with powers to study, develop, or prescribe plant or apparatus, have a most serious responsibility not to use or misuse their powers in such a way as to sap the independence and sense of technical responsibility of the manufacturer or other non-official people.

It is unfortunately an insidious tendency which comes as much by indifference and neglect as by active intention. The latter is seldom to be found. Perhaps an authority feels that it has enough trouble to face in avoiding criticism of the service it gives at home, without worrying whether manufacturers are being deprived of the opportunity they need for fitting themselves to compete in overseas markets against foreign firms who are given a wider overall responsibility for the design, supply, and functioning of plant.

Furthermore, officials sometimes overlook the fact that they benefit much more by having a strong self-reliant industry with good brains than by having one which meekly does what it is told and into which no man of first-class calibre will enter. Such men do not take to posts where cringing earns a better salary and position than critical ability.

What I say is not inappropriate to the fields of aviation lighting, of traffic lighting, of automobile lighting, of electricity or of gas supply, as they are or may develop in the future.

A section of the I.E.S. like this, if it secures the collaboration of the technical officials, can do much to maintain a medium of contact where, on the one hand, the official can fulfil those duties to his country or profession which are not essential to the narrow

ambit of his more official responsibilities, and on the other hand where the technical staffs of manufacturers and others can put a check on commercial rivalries in a desire to pool their experience for the benefit of all concerned.

The Dominating Factors in Exterior Lighting.

What are some of the broad principles which as a rule differentiate exterior lighting from interior lighting?

I suggest to you that interior lighting conditions are akin to daylight conditions. The range of brightnesses over the critical areas of both is relatively narrow, and the brightness level is ample.

With exterior lighting at night the general level of brightness is hardly ever adequate, but in spite of this the range of brightness over which the eye is asked to function is still no less, so that important parts of the field of view are at very low brightnesses.

But when we come to analyse the matter further the two are not so easy to distinguish as at first appears: the range of brightness in the ideal conditions of a sunny clear day may be much greater than in the street at night, and the sun itself and brilliant clouds provide us with a more effective glare source than the most advanced designers of street lighting fittings, or even headlights, have yet achieved. Psychology may come into the problem to a far greater extent than we generally realise.

The variation in brightness which is tolerable on a road surface is much less than that which is permissible in first-class floodlighting.

But two things are obviously different as between daylight or interior artificial light and street lighting; and I suggest that it is in these two things that we must first look for the key to our problems.

The first and most obvious is that the whole level of brightness is much lower. The complex response of the eye to light has often been referred to rather vaguely in discussions of this sort, and it is not very easy to draw any simple picture to portray its complications: the following analogy, which makes no claim to completeness, may serve. We may for this purpose liken the eye to a wireless receiver, having —as many receivers, of course, have to-day—an automatic volume control, which over a considerable range of signal strength keeps the general level of output more or less constant. So long as the volume range of the programme is not too great it does not suffer from the presence of the volume control, though, of course, the range which the set can handle at any one time is limited. But suppose our signal strength becomes weaker and weaker, the volume control increases the gain of the set more and more until its limit is reached, and the softest parts of the programme can no longer be properly reproduced, and the output becomes distorted.

Now something very like this is happening to the eye. At the levels at which we work in daylight or interior lighting, its automatic volume control—which the physiologists call the adaptation process—comfortably adjusts its sensitivity to the signal strength —i.e., the general brightness level—which it receives. But at the low levels which we approach in exterior conditions, this "volume control" can do no more, and we cannot see properly in the darker regions.

Some who are studying these problems feel they must move a step beyond even the conception of brightness which we can take now as firmly established throughout the world, and explore the problems of "sensation," in order to be able to appraise properly those contrasts which we know lie at the foundation of all seeing, and so take into account the action of the "volume control."

Secondly, not only is the brightness level different as between the conditions of interior and exterior lighting, but the field of view, and the attention which it demands, are quite different. The total range of brightness, expressed as a ratio, is not very different in the two cases; in most well-lighted rooms there are plenty of places in which it is too dark to see. But in interior lighting it generally happens that nothing very important has to be seen in the lowest brightness levels—which lie in unimportant places; and it is only when, by bad design, these low-brightness levels encroach on the visually important places that complaints occur. In exterior lighting, however, it is much more difficult to keep the skeleton properly in the cupboard. Regions of low brightness insist on occurring in the very places in which it is essential to see well and quickly, and are much more difficult to dislodge; and it is this fact, aggravated by the limited capabilities of the eye to see at all in the low brightness regions at these adaptation levels which, I think, constitutes the main difference between the street and the interior, and lies at the root of many of our problems.

A given brightness ratio is so much greater to the eye by daylight than under night conditions. Let us be clear about this, because the conception of contrasts and precisely what we mean by the term is not just obvious. As we see by contrasts, it is essential that we should be clear on the point.

Our first instinct—based, I admit, on a certain amount of tradition—is to think of contrast essentially as a ratio rather than as a difference of two brightnesses. I find neither conception by itself helpful as a criterion of what helps us to see—and the subject needs much clarifying. The trouble is that the word "contrast" is used in many different senses, often referring to some arithmetical relation between two brightnesses which appear different to the eye. But contrast is really a *sensation* of difference within the observer, and we do not yet know what relation between two brightnesses to take to express accurately the sensation of difference which they produce. Therefore, it is important, if we use the word "contrast," to define just what we mean by it, since otherwise much confusion may result. Perhaps the only really satisfactory way of expressing a "contrast" in numbers would be to give the actual values of the high and the low brightness, and the value of the brightness of the field to which the observer is adapted.

The relative difference between the two surfaces of a contrast at a general brightness level at night of 0.1 equivalent foot-candle may be 4 to 1. For instance, a telegraph pole may have a brightness of 0.025 and the hedge behind it may be 0.1. By day-

light the same telegraph pole may be 5 equivalent foot-candles and the hedge 20 equivalent foot-candles. The same relative brightness, but what a difference in visibility between the night and day conditions, even though the eye *is* properly dark-adapted for night seeing.

Furthermore, of course, by daylight we also have colour differences to assist our contrasts, whilst at night these are absent.

I don't believe any work has been done to show, for instance, how much greater the relative contrast in brightness must be at night (with a field brightness of 0.1 equivalent foot-candle) to give equal visibility as with, say, a 2 to 1 brightness contrast at a daylight field brightness of 100 equivalent foot-candles.

The contrast threshold has, of course, been studied —but we don't see by thresholds. If the threshold criterion held for contrasts which are not on the threshold, then we should require a contrast of about 4 to 1 at 0.1 e.f.c. field brightness to equal a contrast of 2 to 1 at 100 field brightness.

But such a deduction may or may not be correct. It would require proving before it could be accepted.

We want a general expression for equating brightness contrasts at different levels of field brightness. If we only had this we could begin to find out what we needed in order to make our seeing as effective by night as by day.

It is a good thing to know what we want, even though we can't get it, for it helps our sense of perspective. Meanwhile we draw what conclusions we can from the position in which we find ourselves. And the first lesson I draw is this:—

As a measure for reasonably good seeing by daylight the figure of general level of illumination appears to be a good enough criterion. Relatively speaking, there is ample light and practically all contrasts become readily visible.

But under open air night-seeing conditions the position is much more critical. There is not sufficient light to render all contrasts easily visible. Illumination is far too rough and ready a criterion now to use as a gauge of the effectiveness of seeing.

It is necessary to study the contrasts themselves, and if seeing is to be improved at these low brightness levels, to take steps to accentuate the contrasts.

Does not this mean that for outside lighting we ought to train ourselves to think in terms of brightness and of contrasts of brightness and to translate them into sensation? Furthermore, as time goes on, ought we not to try to express our results accordingly instead of using the overall measure of illumination which could only be justified if it could truthfully be said, which it cannot, that contrasts anyway are fixed and unchangeable, and cannot be altered by the nature or the direction of the light or by changing the nature of the surfaces on which our visibility of objects depends?

In other words it may suffice for us to be illuminating engineers where our range of illumination is from 5 foot-candles upwards. But below this we must be contrast or brightness engineers at heart, whatever actual name we may like the sound of best.

I feel we should have emphasised these principles long ago if we had only had as effective a technique available for brightness and contrast measurement as we have in the case of illumination.

I remember what a revelation it was to many of us 30 years or so ago when Mr. Dow brought out his portable illumination photometer, which could be used either for illumination or brightness measurements. Before that we tended to think and work in terms of candle power of sources simply because, in general, candle power was the only magnitude we thought we could conveniently measure (though it should not be forgotten that Sir William Preece, as early as 1883, emphasised the importance of measuring illumination, and in conjunction with Mr. A. P. Trotter devised an instrument for this purpose).

There were strong opponents in those days of this new quantity illumination—at least as a magnitude for practical use.

I know it is unfashionable to draw analogies from history. But may it not be that any instinctive shrinking we may have from the practical use of the conceptions of contrast and brightness arises from the fact that the process of measuring illumination is now so well established and understood that we are loath to admit a rival and to feel that we may sometime have to leave it for the uncertainties of a new magnitude and of untried methods of measurement?

Lighting on Highways.

Looking at the several subjects for study within the scope of this section, and omitting those which would come under the category of national defence, it looks to me as if street lighting must for the moment claim the chief preoccupation.

Night landing and route indication for aeroplanes is important if aviation lighting is to come within the purview of this section, but progress in these comes from close collaboration between the aviator and the designer of apparatus, which means that its study is necessarily in a limited number of hands. The main inspiration presumably comes from official quarters. This fact would not, I hope, on that account exclude the subject from consideration by this section of the I.E.S., but it is probably one to which a more limited circle of members could contribute.

Automobile headlights, and the glare problem associated with them, form a subject which is crying out for practical measures. Fundamental work has been done here—and published in a treatise by Stiles and Dunbar in a brochure of the Illumination Research Committee. It requires studying, applying, and elaborating, and being made more widely understood. If there are genuine obstacles in the way of improvement in this field it might at least assist matters to learn what they are and where they lie. This section of the I.E.S. would form an admirable platform for studying the matter. As "authorities" are again in part interested in this subject it would

seem desirable to obtain their collaboration in any discussions.

Street lighting has been for three years now the subject of an official inquiry, and all who are interested and in a position to make a constructive contribution to the subject have not only done so but have loyally endeavoured to cause a minimum of embarrassment to the Departmental Committee of the M.O.T. which has been considering it.

So far we have the interim report of this Departmental Committee. It dealt mainly with the lighting of traffic routes. I have the feeling that this report was received with resignation, and (tempered perhaps by the opinion that its proposals were fairly obvious) that it could not do very much harm, and might have been much worse. If I am right in thus summarising sentiment regarding it, I, as a member of the Departmental Committee, feel very gratified. I believe I am in the majority in believing that official recommendations involving technical issues can do much harm unless they are most conservatively conceived in respect of the definiteness of the standards they lay down. For if they lay down standards they can only do so in terms of to-day's knowledge and practice. A British committee making recommendations would hardly dare to use its imagination to the extent of trying to picture the progress of the next ten years and specifying accordingly. It knows the storm of criticism it would encounter, and probably deservedly. The best it can say to itself is, "We have reason to believe that what is considered adequate now may be far from adequate for the requirements and technical developments of the future. An official standard once set up is very difficult to change. Let us devise a recommendation which, whilst giving guidance and indicating a minimum, does not do so in such a way as to make the minimum the standard."

We can, many of us, remember that sad event, some twenty-five or thirty years ago, when a certain edict went forth that 2 foot-candles was the lowest illumination that could be regarded as adequate for normal industrial operations. As we all know, a minimum stated like that is never regarded as the figure to be avoided but rather as the figure to be adopted, unless good reason is advanced to the contrary. I don't think Industry paid heed to it for long—if at all. But there were those whose orderly minds seized hold of the figure of 2 foot-candles and went near to making it the subject of an eleventh commandment. The apologist for regulations will argue that rules once made can be amended. But in practice that is not true, except as the result of representations much more drastic than the mere fact that better efficiency results from better lighting, and that certain premises tend, on account of such regulations, to be behind the times in respect of their level of lighting.

The lesson is, avoid prescribing definite and final figures unless at the same time you make provision for their easy revision. In the B.S.I. Street Lighting Specification, you will remember, we got over the difficulty by prescribing a range of installations from which a lighting authority could choose—each one being defined in respect to its limits. Furthermore, we have resolutely resisted pressure to connect a given class of installation with a given type of traffic. This has had the effect of encouraging an upward trend in street lighting, rather than of fixing it at an immovable level. B.S.I. specifications are based, furthermore, on the principle of frequent and automatic revision. So far as concerns the specification of electric lamps, those who in the early days made themselves unpopular by insisting on a primary rating in watts and not in candle power were, in my opinion, wise and far-seeing. They did it for several very good reasons, one of them being that, as the efficiency of lamps increased with technical advances, the advantage was handed on to the public in the form of an improved standard of lighting. I am wondering whether those who are about to standardise gas mantles will have the same battle to fight with the academically-minded who wish to rate in lumens, because "it is the function of a lamp to give light rather than to consume gas or electricity." I mention this as another example of ways in which we can save the future from being throttled by to-day's regulations, which must inevitably be designed to embody the practice of to-day, or, at most, of to-morrow.

So the Interim Report on Street Lighting was very non-committal on the question of the size and power of light sources for traffic routes, and I venture to suggest that events have shown the wisdom of this. I know that this vagueness has been criticised by engineers of local authorities who feel they ought to be relieved of the necessity of decision in the matter of the size of light sources suitable for the streets under their control. The fact is that it would be difficult to provide too much light—presuming its proper distribution. The limiting factor is what can be afforded. Having made fairly precise recommendations regarding the positioning and height of posts to ensure that all installations can, if desired, be of the best standard, the size and nature of the source—an easily changeable component—is left to the man on the spot.

Somewhat different considerations apply to the question of how the light from the fitting shall be distributed. Could this wisely be laid down to-day? I think we all agree that it cannot. It is, in my opinion, going to be a subject of continuous evolution. What we consider best to-day is going to give place to something still better to-morrow. Sources of light are rapidly changing in form and efficiency. Road surfaces, and road design, upon which so much depends, are evolving. Sometimes the changes assist the lighting, sometimes they make it more difficult.

If we were unlimited in our *expenditure* I imagine most of us could design an excellent installation. We might start by having slender and attractive poles at short spacing on both sides of the road, so using at least twice the minimum number required in the Interim Report. We might then arrange a double system—one with frequent lucidaries (forgive the word, but it was in use in 1690) sending their light downwards so as to make use of the more diffusing properties of the carriageways and footways when such exist. The parallel system might provide

sources on alternate poles, not too glaring in relation to the general field brightness, and which would direct their light in a more horizontal direction so as to make use of the more specular reflection characteristics of the road surfaces. We should at intervals place one of these sources over the centre of the road, using for the purpose a graceful bracket or suspension wire between opposite poles. With both these systems operating simultaneously we should expect to secure very good results over a wide variety of road surface dressings and of dry and wet conditions. When we came to bends in the road the exposed sources would be put on every post on the outside of the bend, whilst the "diffusing" sources would remain as in the straight sections of the road. But we should spend more money than most authorities would be prepared to sanction.

On account of economy the systems we actually install must be a compromise, and that compromise can only be arrived at as the result of experience gained with many installations under all conditions of weather, wear, and service. But I do not myself think that this matters, for the Interim Report, if followed, has ensured that no traffic route installations can be really bad. A reasonable quality is sure, and, this being so, we ought to be content to leave experience and the keen rivalry which exists to achieve the best, to foster a continually improving result. For there is a large amount of talent and effort being expended on this subject both by those who design and those who purchase and maintain installations. It would be easy by premature standardisation to discourage if not to kill this expenditure of effort in healthy rivalry, which has done so much of recent years to improve our street lighting.

I think the measures taken in the Interim Report to secure the minimisation of glare might well be discussed by this section, for I know we can all rid ourselves of prejudices. In fact the general question of glare is, in my opinion, ripe for discussion again in the light of street lighting experience gained during the past few years. Our President, Dr English, raised the question again in his own paper last session. First of all, what does the Interim Report propose? It wisely avoids defining or discussing the phenomenon of glare. But it recommends two practical measures. Sources of light should be put high up (25 ft.) and the light intensity from a lucidary along the road should not be more than six times the intensity from it in the downward direction.

In spite of all the good work which Stiles has done and published, I do not feel we are all clear about what we mean when we speak of glare. I personally always think of glare in terms of the source of light plus the whole field of view in which it happens to be located. I am never able to isolate the source and to regard it as having a certain figure of demerit on account of glare depending on its intensity and the smallness of the angle it subtends at the eye. Such a figure seems to have no meaning except taken in relation to the brightness of the scene at which we are looking. Different parts of that scene may have to be weighted according to their position in the scene—I am not sure—but it is obvious that if the scene consists mainly of the light walls of buildings plus a bright road surface, the glare effect will be much less than if it has in it a large proportion of black sky or trees. It may suffice as a first approximation to take the average brightness over the whole field—but I do suggest that it is unpractical and unhelpful to talk of glare in terms only of the source of light and position without combining this with the equally important factor of field brightness, and particularly the brightness of that part of the field upon which the eye has to concentrate its main attention.

So far as I understand the intention of the I.C.I. pronouncement on the subject (of 1928), it appears to me that my contention is not inconsistent. I raise the point because I sometimes meet individuals who argue in effect that the term "glare" is only applicable to the source and its position, and if field brightness has to be brought in (and they agree its importance) this is not to be included in the term "glare."

There is another form of glare which some people have assured me is not important, but I am not yet convinced. Picture that very common effect in a road so lighted that, not having uniform brightness of surface, it displays a dark area, say, on a bend, with a bright area between you and the dark area. How bright has the bright area to be in relation to the dark area before it acts as a glaring source of light, reducing visibility in the darker area behind? I have certainly seen one case in which increasing the brightness of the bright area, and leaving the dark area untouched, appeared to prevent one from seeing objects which previously were just visible in the dark area. This may be merely a "distraction" effect, but everyone would agree that in an extreme case the effect I describe must be present. I have a feeling that it is present more often than we think and when the brightness differences are not so very exaggerated.

As the final report of the M.O.T. Committee cannot be long delayed, we ought to be thinking what will be the most convenient form for a B.S.I. Specification to implement the recommendations of the report. The Ministry has adopted the view that it has no desire to usurp the functions of the B.S.I. and to issue a street lighting specification. It would prefer to indicate the main principles, and leave all interested bodies, working as hitherto through the Standards Institution, to frame them into a practical specification. Until the report is out and it is known what recommendations there will be over and above those of the Interim Report it is naturally not possible to frame definite ideas, but a good many features of the old specification can well remain.

The requirements for maintenance of installations can well be emphasised, and also reviewed in relation to the newer sources of light which were hardly in existence when the last issue of the specification was made.

The question of whether the placing of lamps on bends or at street crossings should form part of the requirements of the specification will have to be con-

sidered. This may depend on how much is said on the subject in the final M.O.T. report.

In conclusion I think we should note a striking tendency in illuminating engineering, which is found very clearly evident in architectural lighting, but also applies in the streets—the tendency of lighting experts to be more and more preoccupied with the surfaces they illuminate in addition to the design and placing of the lighting equipment.

The planning of a street lighting installation is most vitally dependent on the road surface. This changes radically during the life of the highway and the lighting engineer must consider his equipment in relation to the range over which this variation of characteristics is liable to spread.

Furthermore, he is not only concerned with the road surface; he is concerned with the course of the road, its gradients, road intersections, and surrounding surfaces. These may aid or impede the view, and may help the lighting or defeat its intention.

In the future the public lighting engineer must review from one end to the other the highway he is proposing to light, and make use of every possible opportunity to enhance the effect of his lighting.

We must face the same condition that is now admitted in the lighting of important buildings—that the planning of the structure and the planning of the lighting should proceed hand in hand.

Applications for Membership.

At the general meeting of the Society, held on November 16, 1937, the names of the following applicants for membership were presented:—

Elections Pending.

LIFE MEMBERSHIP:—

Ainsworth, George...242, East 37th Street, New York, U.S.A.

CORPORATE MEMBERS:—

Blowes, W. H. L.....25, Stirling Road, Plaistow, LONDON, E.13.

Butler, B. M.....36, Park Square, LEEDS.

Garry, F. K. .....The British Thomson-Houston Company, Ltd., Crown House, Aldwych, LONDON, W.C.2.

Harris, H. W..... 30, Lidgett Park Avenue, Roundhay, LEEDS.

Hickling, G. T. .....34, Framville View, LEEDS, 8.

Ineson, W. G. .....6, Leyton Crescent Isle, BRADFORD.

Ingham, T. H. .....Brooklyn, Bradford Road, Tingley, Nr. Wakefield, YORKS.

Jordan, J. .....95, Birch Tree Road, Petts Wood, Orpington, KENT.

North, R. .....Linolite, Ltd., 96, Victoria Street, LONDON, S.W.1.

COUNTRY MEMBERS:—

Allsopp, H. M. .....16, The Chalets, Undercliffe, BRADFORD.

Baker, A. W. .....6, Hastings Avenue, Chorlton-cum-Hardy, MANCHESTER.

Donovan, L. E. .....52, William Street, DUBLIN, C.

Farthing, J. E. H. ...The General Electric Co., Ltd., Wellington Street, LEEDS.

Hawes, J. R. .....Runswick, Boswell Street, Rotherham, YORKS.

McCulloch, R. K. . 112, Warriston Crescent, GLASGOW, E.1.

McDonald, A. .....12-13, Eustace Street, DUBLIN.

Marx, Eric .....Oak Cottage, Creskeld Lane, Bramhope, LEEDS.

Stanley, D. .....18, Regent Street, NOTTINGHAM.

Whittaker, J. A. .....12, Oak Hill Road, Nether Edge, SHEFFIELD.

AFFILIATED STUDENTS:—

Beuttell, R. G. .....54, Vineyard Hill Road, Wimbledon Park, LONDON, S.W.19.

Fernando, W. W. D. Lodwin.....143, Gray's Inn Road, LONDON, W.C.1.

Mody, A. V. .....8, Belsize Avenue, LONDON, N.W.3.

Elections Completed.

At this meeting the names of those announced on October 12, which were published in the issue of the TRANSACTIONS (Vol. II., No. 10, October, 1937, pp. 1 and 142), were presented again, and these applicants were formally declared members of the Society.

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

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